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An Analysis of Korea-ASEAN Trade and its Implications for the Shipping Industry in Korea*

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ABSTRACT

The shipping industry is an import economic player in Korea, and demand for shipping closely intertwines with the global trade climate. Understanding how movements of income and price influence freight volume measured in TEU is critical for improving shipping companies' fleet deployment and scheduling. This paper estimated within the framework of a vector error correction model in a time series analysis for the period of 2000Q1 to 2015Q2 trade elasticities of income and real exchange rate of Korea's exports to and imports from ASEAN-5 (Indonesia, Malaysia, the Philippines, Singapore and Thailand). We found that trade elasticity of income exerts a significant, positive influence on the volume of Korea's exports to and imports from ASEAN-5 and that during the same period the real exchange rate exerts asymmetric influence over Korea's trade with them. Surprisingly, we failed to find the Korea-ASEAN FTA to further facilitate trade volume between Korea and ASEAN-5, when measured in TEU.

1. Introduction

The shipping industry is undoubtedly an important player in the global economy, connecting producers and consumers across countries, and over 95% of the world cargo is transported by ships. The importance of the shipping industry in the Republic of Korea (henceforth, Korea) is more prominently acknowledged due to its high trade orientedness. In 2012, the ocean going shipping industry accounted for more than 2.7% of Korea GDP (Ministry of Oceans and Fisheries, 2014), and 99.7% of Korea's total external trade in 2014 was carried by ships.[1]

Demand for shipping is a derived demand since it is believed that shipping demand occurs from seaborne trade which embeds demands for transporting physical commodities from one place to another. Five major

[1] External trade is measured in weight (Ton).

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determinants primarily affect demand for sea transportation: political factors, the development of the world economy, seaborne commodity trade, average haul and transport costs (Lun, Lai and Chung, 2010). Among these determinants, the state of the world economy is a particularly significant factor affecting shipping demand. As an important player in the world economy, the shipping industry's ups and downs are closely coupled with global economic development. Consequently, the relationship between growth of sea trade and world output can be expediently explained by the concept of trade elasticity of income as measured in the ratio of the percentage growth of sea trade to the percentage change in world economic output.

Korea's remarkable economic growth since the early 1960s was fueled by serious export promotions and also by maintaining sound macroeconomic policies and a free trade regime (World Bank, 1993; Krugman, 1994; Stiglitz, 1996). In 2014, Korea stood at the 7th largest trading country, and ASEAN represents an important contemporary trading partner for Korea. Korea's total trade volume with ASEAN in 2014 amounted to $138 billion USD, making ASEAN Korea's second largest trading partner, after China at $235.4 billion USD. Out of Korea's total 2014 trade volume of $1,098.2 billion USD, ASEAN's share was 12.6%, only after China at 21.4%. As seen in Table 1, ASEAN surpassed Korea's other traditional major trading partners such as US (10.5%), Japan (10.4%) and Japan (7.8%).

Table 1
Korea's commodity trade in 2014

	Trading Partners	China	USA	ASEAN	EU	Japan	Total
Exports	Value (US million $)	145,288	70,285	84,577	51,658	32,184	572,665
	(%)	25.4%	12.3%	14.8%	9.0%	5.6%	100.0%
Imports	Value (US million $)	90,082	45,283	53,418	62,394	53,768	525,515
	(%)	17.1%	8.6%	10.2%	11.9%	10.2%	100.0%
Total	Value (US million $)	235,370	115,568	137,995	114,052	85,952	1,098,180
	(%)	21.4%	10.5%	12.6%	10.4%	7.8%	100.0%

Source: The original data was obtained from KITA.net, and then calculated by the authors.

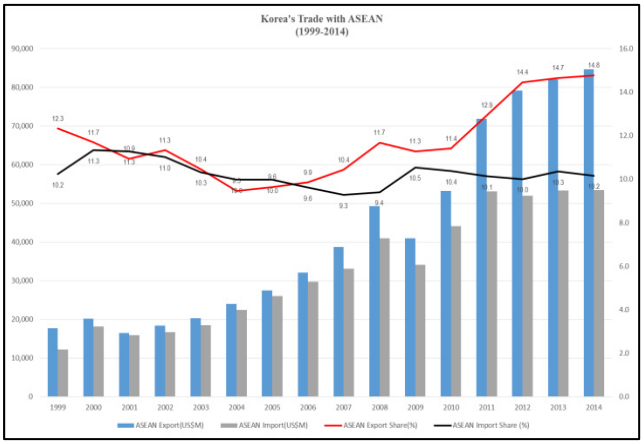

Fig. 1. Development of Korea's trade with ASEAN, 1999-2014
Source: KITA.net

Figure 1 shows the development of Korea's trade with ASEAN over time for the period 1999-2014[2]. During this period, Korea's exports to ASEAN grew by the annual average of 12.2%, exceeding Korea's overall export growth rate of 10.3%. The ASEAN growth rate is second fastest after China at nearly 18% over the corresponding period. Imports from ASEAN grew even faster than exports, recording an annual average growth rate of 12.9% during the period, second after China at 20%. Consequently, ASEAN's market share in both exports and imports in Korea made notable changes over time.

Some major features in Figure 1 deserve mention. The first feature is Korea's trade balance with ASEAN consistently remained in surplus throughout the period 1999-2014. The other is the presence of movements in ASEAN's market share in Korea's exports and imports, with a rising trend since the mid-2000s. ASEAN's market share in Korea's exports almost consistently declined until 2004 when it reached 9.5%. In the post global financial crisis (GFC) period, however, ASEAN's market share in Korea's exports quickly recovered and rose to 14.8% by 2014. The declining trend of ASEAN's market share in the Korea's imports was sustained for a slightly longer period until 2008 when GFC imparted its negative impact more seriously on a global scale. From 2008, the GFC spread more widely to the global economy and caused sluggish global economic performances, causing global resources prices to drop, yet ASEAN retained its market share in the Korean imports around a 10% mark, *i.e*. a 10.2% of the market share in Korea's 2014 total import.

In the case of the Korea's shipping industry, 20.1% of Korea's total trade volume in weight was transported to ASEAN in 2014, and the proportion of the commodities transported by ships was marginally higher in weight at 20.2%. However, in the same year ASEAN's share of the Korea's total imports in weight was lower with 12.6%, of which the portion of commodities, measured in weight and transported by ships also stood. As for the number of containers transported in 2014, Korea exported in total 10,368 thousand TEU (Twenty foot Equivalent Unit) globally. Out of this figure, those bound for ASEAN were approximately to 1,281 thousand TEU, accounting for 12.4% of the total export units. Regarding imports, the ASEAN share is markedly lower, such that only 11.7% of the containers originated from ASEAN out of the total number of import containers constituting 9,464 thousand TEU. Comparing those two statistics, expressed in weight and also in volume, Korea's import from ASEAN was relatively more resource oriented, thus cargo being of bulk type.

In spite of the general importance of ASEAN as major trading partner for Korea, little effort has so far been made in order to estimate the trade elasticity, particularly in the context of income trade elasticity between ASEAN and Korea. Certainly, the estimation of the trade elasticity will help Korean shipping companies plan their fleet deployment and scheduling, efficiently manage routes, and provide essential insight into the projected growth rates of trading partners. The present study makes a contribution by filling this vacuum in the literature by directly estimating long run trade elasticities of income for Korea's bilateral trade with ASEAN.

The remainder of the paper is structured as follows. In section 2, the concepts of trade elasticity of income and price are briefly introduced. Literature on trade elasticities is quite extensive in the international trade

[2] 1999 is when Cambodia joined ASEAN, forming the incumbent 10 member country association, although the history of ASEAN commenced in 1967 when Indonesia, Malaysia, the Philippines, Singapore and Thailand initially formed the association.

field. However, this paper limits its discussion to studies relevant for the purpose of this paper by considering the following two facts. Firstly, this is the first attempt to estimate trade elasticity of income and price in the bilateral trade context of Korea and ASEAN. Secondly, trade will be measured in this paper by the number of container term, rather than in the value term which is more commonly adopted in the paramount of the studies, irrespective of the techniques used to estimate elasticities. In section 3, an economic rationale for transportation demand is explained, which is followed by setting up an econometric model with a view to estimating trade elasticity of income for Korea's export and import for the 2000-2015 period. Quarterly data are utilized for the estimation and the stability of data is subsequently checked and tests are performed if series used are cointegrated. In section 4, the estimation results are discussed and section 5 concludes the paper with implications for the Korea's shipping industry.

2. Concept of Trade Elasticity and Reviews of Literature

Since the 1990s, the growth rate of seaborne trade exceeded the world economic growth rate. The growth of seaborne trade during this period was attributable particularly to the worldwide propagation of supply value chain management through fragmenting production processes and thus stimulating intra-industry trade. This spreading phenomenon in global value chains was accompanied with the liberalization of global trade through lowering tariff and non-tariff barriers, concurrent with significant advancement in telecommunication and transportation technologies (UNCTAD, 2010). With the world economic crash after the GFC and the subsequent Great Recession, a great collapse of trade also ensued (Alessandria, Koboski and Midrigan, 2010; Crowley and Luo, 2011, among others).[3] The contraction of aggregate demand during the Great Recession period accounted for 90% of the decline in the world trade (Baldwin, 2009). Nevertheless, Constantinescu et al. (2015) reported that the long run income elasticity of world trade in 2001-2013 was 1.31, which is lower than the corresponding elasticity of 2.18 in 1980-2000. The income elasticity of trade, also known as trade elasticity of income as used in this paper, measures as the ratio of the percentage changes of trade, *i.e.* export or import, relative to percentage changes of income of trading partners, *ceteris paribus*.

Since the report of Houthakker and Magee (1969) presenting large differences of income elasticities of trade flows existing across countries, an extensive body of literature emerged dealing with the issues of income elasticity, *i.e.* trade elasticity of income according to this paper's terminology. The literature, as evidently and extensively reviewed in Markusen (2013), Katenci and Uz (2011) and Wu (2008), attempts to provide theoretical foundations by adopting different assumptions of production side determinants, types of competition and market structures and also of such demand side determinants of income and income distribution and preference types, in order to justify the observed income elasticities. In parallel with theoretical efforts made, various estimation methods were adopted in empirical studies, ranging from OLS, panel estimation, cointegration, and also non-econometric studies such as in Tokarick (2010). Fundamentally, those studies were motivated by the consideration that a country facing unfavorable trade elasticity must grow slower than trading partners or risk experiencing a trend of worsening current account balance or depreciation of its national currency. The overall conclusion seemed that income was an important determinant (Markusen, 2013) and that there could be differences in income elasticities across countries and over time when a country's overall export or import elasticities were estimated (Wu, 2003, p.5). In fact, Marquez (1990) reported that in his estimation of income and price elasticities for the bilateral trade flows, there was enough dispersion in the estimated elasticities such that the direction of trade was sensitive to changes in income and prices (Ketenci and Uz, 2011). Nevertheless, only a scant body of evidence was accumulated estimating Korea's income elasticity of bilateral trade flows in relation to a specific country or supranational group such as ASEAN.

In investigating the impact of Korea's outward FDI on Korea's exports and imports during the 1987-2002 period by using a fixed effect panel data method, Seo and Suh (2006) found that outward FDI exerted a positive effect on Korea's exports. Phan and Jeong (2014) considered the intra-industry trade between Korea and ASEAN for the period 1997-2011 and found that the income similarity between Korea and ASEAN and foreign direct investment contributed positively to the increased IIT, whereas differences in factor endowments were negatively correlated. Shim (2013) looked at the changes in the manufacturing trade structure between Korea and ASEAN by using trade specialization index and Grubel-Lloyd Index for the period 2000-2011. These studies, while relevant, did not investigate the trade elasticity of income between Korea and ASEAN. Interestingly, Son and Kim (2013) found trade elasticities of Korea's trade with ASEAN-6 countries exceeded 1, at 1.087 for the pooled OLS and 1.054 for the fixed effect model for the period 1997-2011, both being highly statistically significant. Nevertheless, these results seem questionable because other parameters in the estimated model had opposite signs, contrary to what they were normally expected to have, indicating that the study may have suffered from an endogeneity and/or simultaneity bias among regressors. Furthermore, Son and Kim (2013) did not consider the trade elasticity of income in the context of trade volume measures, either in weight or in TEU. Two studies specifically considered trade changes and its impact on freight markets. Jeon et al. (2014) highlighted factors affecting world trade patterns by types of markets, such as container ship market, dry bulk ship market and oil tanker markets by adopting the whole world as the objective of an analysis. A study by Lee et al (2013) was more specific and used the GTAP model in exploring the impact of Korea-ASEAN FTA on trade volume, utilizing UN COMTRADE database with 2004 as the base year. After estimating the value of trade following Korea's FTA with the EU, the US and ASEAN, they calibrated trade volumes by using a conversion of value flows to volume flows by different commodities. Our study is differentiated in the sense that we will directly make use of the number of containers as trade volume between Korea and ASEAN in estimating trade elasticity of income for Korea's export to and import from ASEAN.

3. The Model and Econometric Estimation Strategy

3.1. *The Model*

Demand for transportation, especially shipping demand, is closely related with trade, exports and imports, as a derived demand. That is,

$$\mathrm{td}(h)_j^i = \mathrm{f}(trade)_j^i \quad (1)$$

[3] Crowley and Luo (2011) identify that, in addition to the contraction of aggregate demand, difficulties in obtaining trade finance and rising trade barriers during 2008-2009 also contributed to the great trade collapse, as supply side factors.

where *td* is the freight transportation demand between exporting country *i* and importing country *j*, and *trade* means trade volume between the two countries.

Trade is, as most of import and export demand express, a function of national income, relative price and exchange rate between exporting and importing countries, and trade policy variables such as free trade agreement, among many other potential factors (Senhadji and Montenegro, 1998). It is expected that an increase of national income in the importing county will stimulate more import demand, *ceteris paribus*, thus more trade, which is closely related with the concept of trade elasticity of income. Trade is also influenced by the relative prices between importing and exporting countries. Assuming that the domestic price of the importing country remains constant, an increase of export price from the exporting countries may lead to lessening demand for the importables from the exporting country, and *vice versa*. In addition, the exchange rate between the importing and exporting countries can affect import demand as exchange rate changes can not only create a substitution effect between the importable and domestic goods but also can similarly generate an income effect with which more or less demand for the importable can be disseminated. These two are combined and expressed as real exchange rate between the importing and exporting countries.

One last variable captures trade policy, particularly that of trade facilitating policy measures. In our estimation, regional trading agreement, particularly free trade agreements (FTA), have emerged as noticeable global trend since the inauguration of the World Trade Organization. FTAs are complex systems of the tariff concessions between the parties of the agreement. The abolition or reduction of tariff comes into effect gradually according to an agreed time table, with some products taking as long as 20 years and still others excluded from FTA negotiations. Once coming into effect, FTAs reduce or abolishe tariffs for the relevant products traded between the signatory parties. Thus, an FTA is expected to exert positive effects on the bilateral trade between the parties.

Following the aforementioned arguments, trade can be expressed as a function of national income of the importer, (y), relative export price between exporting and importing countries, (*rxp*), exchange rate between the two countries, (*xr*), and free trade agreements. Instead of using nominal exchange rate and relative price variables separately, real exchange rate (*rxr*) is used by adjusting the exchange rate with the relative price levels between the exporting and importing countries. Thus, the shipping demand can be expressed as following:

$$\mathrm{td}_j^i = \mathrm{h}\left(y_j, rxr_{j,}^i\, fta_j^i\right) \tag{2}$$

3.2. *Econometric Model and Estimation Strategy*

In estimating the shipping demand function as specified in Equation (2), we use the number of containers expressed in TEU as a dependent variable, instead of the commonly used export or import values between the exporting and importing countries. This innovative choice is rooted in the notion that though the value of trade between countries is important for general economic welfare and policy purposes, TEU is of greater interest for the shipping industry, especially for liner shipping and tramp shipping firms, in terms of fleet deployment and management and also of an efficient scheduling.[4] Since the main aim of this paper is to estimate trade elasticity of income for the freight between Korea and ASEAN, trade in TEU is deemed more suitable than trade in values.

Subsequently, we adopt the following linear specification of the import demand function of country j for Korean exports:

$$teu_{jt}^{kor} = \beta_0 + \beta_1 y_{jt} + \beta_2 rxr_{jt}^{kor} + \beta_3 fta_j^{kor} + \varepsilon_{jt} \tag{3}$$

where teu_{jt}^{kor} is the number of containers exported to country *j* from Korea in period *t*. y_{jt} represents the income of country *j* in period t, and country j's nominal GDP measured in billion local currency term is used as a proxy variable. In the case of the import demand function, teu_{jt}^{kor} means Korea's import from country j, and the income variable means Korea's nominal GDP. Nominal GDP figures were deflated by the country's GDP deflator (2010 = 100). The real GDP is expected to have a positive sign. rxr_j^{kor} denotes the nominal exchange rate between Korea and country *j*, adjusted by the relative price between them. That is, $rxr_j^{kor} = e\frac{p^j}{pkor}$ in which the exchange rate, *e*, is Korean won per country j's currency. The relative price of exportable between Korea and country *j* in period t is measured as the ratio of country *j*'s consumer price index (CPI) to that of Korea. CPI is chosen to express the relative price index between Korea and ASEAN because CPI reflects not only the prices of domestically produced goods but also the prices of the imported goods in country *j*. In addition, CPI is one of a few price variables which are consistently available across ASEAN countries. Once constructed, an increase of real exchange rate means that the value of Korean currency, *Won*, drops relative to country *j*'s currency, thus making Korean products cheaper, resulting in an increased demand for the products, *ceteris paribus*. Therefore, the expected sign of the real exchange rate for Korea's export is positive. However, in the import demand function for Korea's import from ASEAN, the expected sign will be negative. fta is a dummy variable which represents the free trade agreement signed and implemented between Korea and country *j*. It will take value of one from the time period when FTA comes into force, and zero otherwise. Although the Korea-ASEAN FTA has been signed in June 2006, the actual FTA came into effect from July 1, 2007, and thus fta will take the value of 1 from the 3rd quarter of 2007 and onwards.[5]

Five ASEAN member countries are included in estimating income elasticities, specifically Indonesia, Malaysia, the Philippines, Singapore and Thailand. These countries represent Korea's major trading partners among ASEAN. Due to the paucity of even the most common macroeconomic data on a quarterly basis, all other ASEAN countries are excluded from the estimation. The time period of the data used for the estimation is confined to 2000Q1 to 2015Q2. Korea's trading volume measured in TEU, with those five ASEAN member countries, are consistently available since 1998 from *Korea Customs and Trade Development Institute'* statistical database. However, we expediently exclude the 1998-1999 period from the estimation because this period overlapped with the Asian Financial Crisis, we use our *ex ante* expectation that the initial benchmark period of the 1998-1999 may be regarded as an anomaly. All other variables used for the estimation are matched accordingly, and the original data are obtained from *International Financial Statistics* from IMF's e-library and converted in the required format. These quarterly data are seasonally adjusted by using Eviews'

[4] Bulk shipping and liquid and gas tanker shipping are also of important relevance for shipping firms, but these types of freights are more or less of long-term contract in nature although there is a demand arising from spot markets.

[5] Unlike Korea-ASEAN FTA, however, Korea-Singapore FTA was ratified in March 2006. Therefore, FTA dummy will have 1 from the first quarter of 2006 for Korea-Singapore trade.

moving average seasonal adjustment technique.

Estimations were conducted for those five ASEAN countries individually. Before conducting estimations, each time series data of respective countries was checked against the stability of data. And all of the data were found non-stationary, I(1) variables. In this case Equation (3) should be normally estimated in a differenced form in order to derive estimates of the relevant parameters by avoiding any spurious regression results. However, it is possible that the series of concern may be cointegrated. If so, we can estimate the equation in a level VAR form. In fact, our actual estimations were conducted in a vector error correction form, as specified in Equation (3), where the long run relationship may exist between trade volume measured in TEU, country j's income, real exchange rate and FTA. And if the variables are I(1) and cointegrated, a cointegrating equation is expected in short run dynamics to restore themselves towards long run equilibrium. We checked if variable were cointegrated using the Johansen (1995) cointegration method of the maximum eigen value test and trace test, with various specification available in Eviews. [6]

$$\Delta X_t = \sum_{i=1}^{k-1} \Gamma_i \Delta X_{t-i} + \Pi X_{t-1} + \mu_0 + \varepsilon_t \quad (4)$$

where X is a vector of variables and Γ is a matrix of parameters while Π is the cointegration parameter matrix, presenting the speed of adjustment toward the long-run equilibrium.

4. Discussion of the Results of Trade Elasticity

The results of VEC estimation are presented below. In presenting, we rely on our prior knowledge of the long run relationship as in Equation 2, such that the cointegration is presented as normalized per TEU. Thus, the normalized cointegration equations which show the long run relationship between the variables for Korea's TEU export to and import from five ASEAN countries, are separately presented in Tables 2 and 4. Note is that the estimated parameters represent the elasticity of each variable of concern, due to the specification of models in a logarithmic form, except the dummy variable, FTA.

Table 2
Normalized cointegration equation for Korea's exports to ASEAN

	Indonesia	Malaysia	Philippines	Singapore	Thailand
TEU	1.000000	1.000000	1.000000	1.000000	1.000000
Income variable ($RGDP_{-1}$)	**-0.687318**	**-3.278943**	**-0.606012**	**-1.070908**	**-4.735376**
	(0.20873)	(0.40793)	(0.20023)	(0.38360)	(0.25242)
	[-3.29285]	[-8.03797]	[-3.02665]	[-2.79171]	[-18.7598]
Real Exchange Rate (RXR_{-1})	**-0.872233**	**-2.455757**	**-1.98112**	1.765933	**-4.564425**
	(0.24158)	(0.50437)	(0.23218)	(0.34194)	(0.39562)
	[-3.61058]	[-4.86893]	[-8.53268]	[5.16449]	[-11.5374]
Free Trade Agreement (FTA_{-1})	0.112883	0.468422	0.339765	-0.087069	0.821649
	(0.04700)	(0.08951)	(0.05479)	(0.09703)	(0.06894)
	[2.40165]	[5.23324]	[6.20118]	[-0.89734]	[11.9184]
Constant	-1.22066	8.861306	0.233114	-7.611706	17.75578

Note: Estimation was made by using EViews, and figures in the () and [.] represent standard errors and t-statistics of estimated parameters, respectively.

As seen in Table 2, long run trade elasticities of income for Korea's export to five ASEAN countries the prime interest of this study, have all expected positive sign and statistically significant. The magnitude of the income elasticities varies across those five countries, with the values ranging between 0.60 and 4.73 in the table. Thailand shows the highest trade elasticity of income with 4.73, followed by Malaysia which has the elasticity of 3.27, and then by Singapore (1.07), Indonesia (0.68) and the Philippines (0.60). Though it is not directly comparative, it is interesting to observe that the trade elasticities of income for Korea's export to Thailand and Malaysia are far greater than many of the reported income elasticities, measured in the value term. According to the our estimates, if Thai economy grows by 1%, Korea's export container volume to Thailand will increase by 4.73%, and similarly 1% growth in the Malaysian economy will lead to 3.27% increase of Korea's export to Malaysia, measured in TEU. Therefore, if economic growth rates of those five ASEAN countries are the same and other things remain unchanged, Korean shipping companies may give priorities in their fleet planning to those countries of higher trade elasticity of income in the order of Thailand, Malaysia, Singapore, Indonesia and the Philippines.

Elasticities of real exchange rates, also conventionally known as trade elasticity of price, have expected positive signs for four ASEAN countries, except Singapore. The corresponding magnitude of the elasticities vary between 0.87 and 4.56. Thailand has the highest price elasticity of 4.56, followed by Malaysia (2.45), the Philippines (1.98) and Indonesia (0.87). If the real value of Korean *Won* depreciates by 1%, relative to the currency of those four ASEAN countries, Korea's export volume measured in TEU will increase respectively by 4.56%, 2.45%, 1.98% and 0.87%. The price elasticity of Singapore, (-1.76), is statistically significant but negative sign, contrary to expectation.

The free trade agreement dummy, *FTA*, is the least satisfactory among the variables included. The FTA has negative signs, contrary to expectation, and statistically significant for four ASEAN countries of Thailand, Malaysia, the Philippines and Indonesia. Singapore has the expected positive sign but is statistically insignificant. This suggests that the Korea-ASEAN FTA did not lead to increased export volume to ASEAN as measured in TEU, although it might have increased Korea's export to those countries in value. However, it is a little premature to conclude that FTA does not influence on Korea's export volume measured in TEU. Instead, a caution should be taken in interpreting the results as the ratification of the Korea-ASEAN FTA closely overlaps with the beginning of the global financial crisis and subsequent global recession.

Results of full error correction estimation for Korea's export to ASEAN in TEU are presented in Table 3 for each individual country where an optimal lag length could vary and the optimal lag length was chosen by using Akaike Information Criterion (AIC) of the error correction model estimations. As seen in the table, the identified cointegration equations were all statistically significant. The coefficients of error correction terms for each of ASEAN five countries were negative and within the range of between 0.25 ~ 0.52, in absolute value terms. The adjustment coefficient of 0.520 for Malaysia means that about 52% of disequilibrium will be adjusted within one period, while 42%, 39% and 35% of the disequilibrium are adjusted within one period in Indonesia, the Philippines and Singapore while in Thailand merely 25% of the disequilibrium will be adjusted within one period.

[6] The test results for the unit roots and cointegration of the series are not reported due to the space limitation, but readily available from the authors, upon request.

Table 3

Results of error correction model estimation for Korea's exports to ASEAN

	Indonesia	Malaysia	Philippines	Singapore	Thailand
Error Correction:	D(TEU)	D(TEU)	D(TEU)	D(TEU)	D(TEU)
CointEq1	**-0.427278**	**-0.520395**	**-0.39373**	**-0.351154**	**-0.257381**
	[-4.17425]	**[-4.17920]**	**[-3.24179]**	**[-2.69239]**	**[-3.35550]**
D(TEU(-1))	-0.166622	0.249286	0.153335	0.253167	0.318277
	[-1.29977]	[1.86873]	[0.97716]	[1.34029]	[1.86917]
D(TEU(-2))	0.026786	0.272422	0.449528	0.504486	-0.139225
	[0.21662]	[1.85301]	[2.87610]	[2.40183]	[-0.78517]
D(TEU(-3))		0.116308	0.142209	0.675252	-0.046305
		[0.87297]	[0.91662]	[3.57101]	[-0.25678]
D(TEU(-4))		-0.226422	-0.226085	-0.090359	-0.249854
		[-1.65934]	[-1.45915]	[-0.41298]	[-1.48711]
D(TEU(-5))		0.026562		-0.057903	0.084480
		[0.20784]		[-0.29767]	[0.50396]
D(TEU(-6))		0.225504		0.130488	
		[1.74278]		[0.70195]	
D(TEU(-7))				0.122740	
				[0.62536]	
D(RGDP(-1))	-0.568893	-2.828363	0.334413	-0.904907	-1.042907
	[-0.44437]	[-2.05552]	[0.32492]	[-0.97334]	[-1.90049]
D(RGDP(-2))	1.363520	-5.650544	-0.110031	-2.113544	-0.586273
	[1.13526]	[-3.89849]	[-0.13178]	[-2.26609]	[-0.94415]
D(RGDP(-3))		-1.875057	1.254226	-1.748413	0.115602
		[-1.30387]	[1.32971]	[-1.85755]	[0.18116]
D(RGD(-4))		0.747785	-0.107731	-1.314314	-0.261429
		[0.58858]	[-0.12711]	[-1.47167]	[-0.43379]
D(RGDP(-5))		-4.997459		-0.872718	-0.422634
		[-3.98131]		[-0.85519]	[-0.86177]
D(RGDP(-6))		-1.492212		-1.259876	
		[-1.27968]		[-1.36184]	
D(RGDP(-7))				-1.322728	
				[-1.60339]	
D(RXR(-1))	**-0.507392**	-1.41825	-0.328083	-0.045927	-0.770815
	[-2.29011]	[-3.11366]	[-1.02674]	[-0.10751]	[-2.08409]
D(RXR(-2))	-0.211497	-0.895817	0.521622	-0.64975	-0.29941
	[-0.93519]	[-1.91286]	[1.68735]	[-1.22285]	[-0.86075]
D(RXR(-3))		-0.887811	-0.467425	0.359827	-0.351296
		[-2.15243]	[-1.55260]	[0.74144]	[-1.09765]
D(RXR(-4))		-0.396047	0.306217	-0.330965	-0.381807
		[-0.97204]	[0.95503]	[-0.66974]	[-1.22315]
D(RXR(-5))		-0.950287		-0.484707	0.270706
		[-2.45679]		[-0.86099]	[0.89411]
D(RXR(-6))		-0.910024		-0.796765	
		[-2.30117]		[-1.40467]	
D(RXR(-7))				-0.040327	
				[-0.06983]	
D(FTA(-1))	**0.081532**	0.211484	0.109117	-0.060358	0.205880
	[2.24399]	[3.20659]	[1.94228]	[-1.11820]	[3.39185]
D(FTA(-2))	0.021231	0.210316	0.127372	-0.089303	0.193576
	[0.56821]	[3.26397]	[2.33612]	[-1.62167]	[3.28111]
D(FTA(-3))		0.217752	0.106200	-0.090187	0.165538
		[3.69095]	[2.10483]	[-1.57186]	[2.81338]
D(FTA(-4))		0.197329	0.077076	-0.02025	0.095970
		[3.09413]	[1.59521]	[-0.42561]	[1.76166]
D(FTA(-5))		0.219305		0.002866	0.130264
		[3.87877]		[0.06146]	[2.73763]
D(FTA(-6))		-0.032991		-0.096548	
		[-0.63279]		[-1.94861]	
D(FTA(-7))				-0.059046	
				[-1.09763]	
C	-0.00323	0.065510	-0.01349	0.059481	0.005355
	(0.01229)	(0.02104)	(0.01699)	(0.02576)	(0.00750)
	[-0.26293]	[3.11347]	[-0.79415]	[2.30939]	[0.71428]
R-squared	0.412686	0.767309	0.433129	0.586567	0.497635
Adj. R-squared	0.304812	0.566714	0.186032	0.087001	0.187351
Sum sq. resids	0.057817	0.022783	0.045034	0.036565	0.036852
S.E. equation	0.034350	0.028029	0.033981	0.039033	0.032922

Table 4 presents the normalized cointegration equations for Korea's import from ASEAN countries. In this normalized cointegration equation, trade elasticities of income for Korea's import from ASEAN are of expected signs and statistically significant. That means the increase of Korean income, as measured as real GDP, will accompany an increase of Korea's imports, measured in TEU, from those countries. The magnitude of trade elasticities varies from 16.06 to 1.36, and most of these trade elasticities of income are larger in magnitude than what was normally reported in other studies. The highest trade elasticity is observed for Korea's import from Singapore, *i.e.* if the Korean economy grows by 1% Korea's imports measured in TEU from Singapore will increase by 16%. The same 1% increase will lead to a 5.3% import increase from Indonesia, followed by 3.1% from Malaysia, 1.7% from the Philippines, and 1.4% from Thailand.

Table 4

Normalized cointegration equation for Korea's imports from ASEAN

	Indonesia	Malaysia	Philippines	Singapore	Thailand
TEU	1.000000	1.000000	1.000000	1.000000	1.000000
Income variable ($RGDP_{-1}$)	**-5.30434**	**-3.146994**	**-1.780867**	**-16.05982**	**-1.363453**
	(0.69706)	(0.15551)	(0.28297)	(3.86558)	(0.24848)
	[-7.60961]	[-20.2362]	[-6.29337]	[-4.15457]	[-5.48719]
Real Exchange Rate (RXR_{-1})	-0.096415	-1.92821	-0.634687	-0.389649	1.730730
	(0.45084)	(0.15173)	(0.31024)	(1.59281)	(0.45501)
	[-0.21386]	[-12.7078]	[-2.04577]	[-0.24463]	[3.80375]
Free Trade Agreement (FTA_{-1})	0.554978	0.368679	0.116075	2.436692	-0.127561
	(0.11692)	(0.02675)	(0.05911)	(0.55901)	(0.07512)
	[4.74656]	[13.7849]	[1.96376]	[4.35892]	[-1.69813]
Constant	23.99326	17.39129	6.373384	82.79031	0.377957

Note: Estimation was made by using EViews, and figures in the () and [.] represent standard errors and t-statistics of estimated parameters, respectively.

By construction, the real exchange rate variable is expected to have negative signs in the Korea's import demand equation since the rise of real exchange rate means Korean *Won* gets real depreciation *vis-à-vis* local currency, thus making importables less competitive and resulting in the reduced imports from these countries. While the influence of real exchange rate on Korea's export to ASEAN were predominantly consistent with *a priori* expectation, such a consistency seems to break down in the Korea's import equation from ASEAN countries, creating an asymmetric nature of exchange rate movements and its influences on trade, at least measured in TEU term. Among those five cointegration equations, only one country, Thailand, has a negative sign of the elasticity which is statistically significant. If Korea's real exchange rate increases by 1%, Korea's import in TEU will decrease 1.73% from Thailand. However, the long run real exchange rate elasticities of Indonesia, Malaysia, the Philippines and Singapore are contrary to the expectation in the sense that these elasticities are positive. The trade elasticities of price for Indonesia and Singapore are statistically insignificant. The elasticities for Malaysia and the Philippines are statistically significant, indicating that 1% real depreciation of Korean currency relative to Malaysian Ringgit and the Philippines Peso will increase Korea's import measured in TEU by 1.9% and 0.6%, respectively.

The effects of Korea-ASEAN FTA on Korea's import from these ASEAN countries are against expectation, as it was in Korea's export cointegration equation. The ratification of Korea-ASEAN FTA seems to have a positive impact on Korea's imports from Thailand but the estimated coefficient does not lend any statistical significance. All the estimated long run coefficients of FTA are negative and statistically significant for Indonesia, Malaysia, the Philippines and Singapore. Certainly, these coefficients are derived from the situation in which trade is measured in TEU, not in terms of value, and thus a caution needs to be exercised in interpreting the impact of Korea-ASEAN FTA. This potential anomaly deserves a more systemic investigation by separating the ratification of Korea-ASEAN FTA which almost closely overlaps with the global financial crisis and the subsequent global recession. Nevertheless, the estimated coefficients only lead us to conclude that the same FTA consistently exerts a significantly negative effect on Korea's import from four countries of ASEAN, *i.e.* Indonesia, Malaysia, the Philippines and Singapore, if measured in container volume term.

In table 5, results of full error correction estimation for Korea's imports in TEU from ASEAN countries are presented, and the optimal lag lengths vary for each individual country. For any disequilibrium occurrence, a dynamic adjustment will take place, and the coefficients representing the speed of adjustment vary between 0.97 and 0.01. For Singapore and Thailand only 1% and 8% of the adjustment will be made within a period, but the short run dynamics of the cointegration equation seem statistically unwarranted for these two countries. The fast adjustment take place in the Philippines where 97% of the disequilibrium will be adjusted towards the equilibrium within one period while in the Philippines and Indonesia 83% and 21% of the adjustment will happen within one period.

Table 5

Results of error correction model estimation for Korea's import from ASEAN

	Indonesia	Malaysia	Phlippines	Singapore	Thailand
Error Correction:	D(TEU)	D(TEU)	D(TEU)	D(TEU)	D(TEU)
CointEq1	-0.211332	-0.975673	-0.833663	-0.010945	-0.081144
	[-4.16248]	[-3.84885]	[-4.90893]	[-0.75844]	[-0.44739]
D(TEU(-1))	-0.394291	0.238966	-0.128668	-0.357978	-0.308377
	[-2.46198]	[1.33775]	[-0.75208]	[-1.82848]	[-1.22822]
D(TEU(-2))	-0.157807	-0.186621	-0.422411	-0.018412	-0.131666
	[-0.94011]	[-1.25509]	[-2.65792]	[-0.09980]	[-0.51919]
D(TEU(-3))	-0.270386	0.027738	-0.061553	0.066487	0.132612
	[-1.71799]	[0.18829]	[-0.32664]	[0.39306]	[0.46950]
D(TEU(-4))	0.789608	0.150192	-0.159025	-0.240674	0.391260
	[3.89931]	[1.03398]	[-0.89496]	[-1.44573]	[1.62931]
D(TEU(-5))	0.263345	0.143848	0.069053	-0.169696	0.308691
	[3.04446]	[1.09127]	[0.37938]	[-1.14536]	[1.42514]
D(TEU(-6))	0.518354	0.177266	0.099274		0.067651
	[4.73135]	[1.38085]	[0.63925]		[0.48713]
D(TEU(-7))	0.415310		-0.187557		
	[3.92162]		[-1.14455]		
D(TEU(-8))	0.199186		-0.037442		
	[2.04499]		[-0.25416]		
D(TEU(-9))	-0.07347		-0.251282		
	[-0.81739]		[-1.70681]		
D(RGDPK(-1))	2.819070	-3.615958	-4.134912	7.172948	-0.734611
	[2.41264]	[-1.94880]	[-1.97262]	[4.65092]	[-0.41295]
D(RGDPK(-2))	-0.184585	-3.590308	0.851955	2.683950	0.602489
	[-0.17985]	[-2.58588]	[0.45478]	[1.31193]	[0.40379]
D(RGDPK(-3))	0.544436	-2.399723	-4.232636	-1.323056	-0.202264
	[0.52356]	[-1.83752]	[-1.90463]	[-0.73637]	[-0.14660]
D(RGDPK(-4))	2.541903	-3.306282	3.301084	3.043005	0.464400
	[2.06950]	[-2.62383]	[1.70751]	[1.64906]	[0.35413]
D(RGDPK(-5))	-7.303644	-1.962313	0.456508	2.326531	-0.851194
	[-6.73517]	[-1.63100]	[0.24539]	[1.19214]	[-0.70599]
D(RGDPK(-6))	0.804415	-2.000932	-5.754297		-2.075559
	[0.62659]	[-1.64394]	[-2.99222]		[-1.46911]
D(RGDPK(-7))	-0.237176		1.305127		
	[-0.23171]		[0.69086]		
D(RGDPK(-8))	-4.122764		-2.23232		
	[-3.86162]		[-1.22232]		
D(RGDPK(-9))	3.898669		2.062571		
	[3.63596]		[1.22478]		
D(RXR(-1))	-0.605193	-1.774204	-0.625235	0.020055	-0.603224
	[-2.71742]	[-3.55871]	[-1.30836]	[0.05508]	[-1.81030]
D(RXR(-2))	0.274698	-1.671007	-0.591861	-0.057651	-0.417728
	[1.48064]	[-3.36241]	[-1.27783]	[-0.16893]	[-1.08123]
D(RXR(-3))	0.582283	-1.458505	0.103545	0.370206	0.215495
	[2.64259]	[-2.99576]	[0.22256]	[1.04443]	[0.68572]
D(RXR(-4))	0.183334	-0.816757	0.074228	0.300215	0.602259
	[0.86971]	[-1.77826]	[0.17153]	[0.78548]	[2.09196]
D(RXR(-5))	-0.309066	-0.418444	0.044484	0.367141	-0.096707
	[-1.91347]	[-1.07166]	[0.12092]	[0.90020]	[-0.36850]
D(RXR(-6))	0.335183	-0.309092	-0.070436		-0.152953
	[2.01011]	[-0.85929]	[-0.19654]		[-0.58028]
D(RXR(-7))	0.156173		-0.400132		
	[0.82023]		[-1.08599]		
D(RXR(-8))	0.256683		0.001102		
	[1.32893]		[0.00306]		
D(RXR(-9))	-0.311493		0.164980		
	[-1.57333]		[0.48951]		
D(FTA(-1))	-0.010413	0.304295	0.094173	0.046464	0.095530
	[-0.46816]	[3.82529]	[1.93399]	[1.04830]	[2.59708]
D(FTA(-2))	0.060521	0.264672	0.026955	-0.013734	-0.208347
	[2.69604]	[3.39655]	[0.64703]	[-0.33450]	[-5.12723]
D(FTA(-3))	0.016562	0.297691	0.058595	0.026559	0.103138
	[0.70364]	[3.80220]	[1.26566]	[0.68871]	[1.94344]
D(FTA(-4))	0.178770	0.240033	-0.001159	-0.014264	0.020498
	[8.30276]	[3.29735]	[-0.02757]	[-0.36729]	[0.34716]
D(FTA(-5))	-0.160658	0.212115	0.020681	0.005405	-0.015819
	[-5.30566]	[3.38952]	[0.45550]	[0.13869]	[-0.27755]
D(FTA(-6))	0.013739	0.082164	-0.134146		-0.036553
	[0.28427]	[1.53580]	[-2.94964]		[-0.61272]
D(FTA(-7))	0.146157		-0.283269		
	[2.55292]		[-3.86207]		
D(FTA(-8))	-0.063147		-0.066011		
	[-1.32438]		[-0.87394]		
D(FTA(-9))	0.260911		-0.184663		
	[4.50051]		[-2.31061]		
C	-0.009365	0.045112	0.068455	-0.058007	0.017159
	[-0.44111]	[2.62318]	[2.10307]	[-2.34937]	[1.06342]
R-squared	0.977505	0.716484	0.897095	0.585773	0.847435
Adj. R-squared	0.918053	0.472074	0.625132	0.329927	0.715914
Sum sq. resids	0.002849	0.018722	0.009806	0.032384	0.022413
S.E. equation	0.014266	0.025409	0.026466	0.030862	0.027800

5. Conclusion

ASEAN is the Korea's second largest trading partner in 2014, yet studies conducted on Korea's bilateral trading relationship with ASEAN member countries are scarece. By employing the concept of trade elasticity of income which is measured as the percentage change in trade to percentage change of incomes of ASEAN countries or Korea, this study estimated by using error correction model framework for the period 2000Q1-2015Q2. Instead of popular approaches used in more traditional trade literature focusing on trade value, this study made use of the number of containers exported by Korea to and from ASEAN countries as the concerned dependent variable of measurement based on a conventional export demand function and the relevant determinants. The error correction results showed that the variables of income, real exchange rate and FTA formed the long rum equilibrium relationship between Korea and five ASEAN countries of Indonesia, Malaysia, the Philippines, Singapore and Thailand during this particular time period.[7]

The study found that the trade elasticities of income for Korea's export to five ASEAN countries vary across countries. The magnitude of the estimated trade elasticities are also significant and in the descending order of Thailand, Malaysia, Singapore, Indonesia and the Philippines. Korea's exports in TEU to Thailand were the most vibrant in the sense that 1% increase of Thailand's economic growth spurs 4.73% increase of Korea's export volume in TEU to the country. In the case of the Philippines, however, the corresponding figure is merely 0.60.

Trade elasticities of income for Korea's import from ASEAN, when measured by using TEU, were positive and statistically significant although there were varied magnitudes of the estimated elasticity among them. The highest trade elasticity of income for Korea's import was observed for Singapore, implying that 1% increase in Korea's economic growth would accompany 16% increase of Korea's import from Singapore, when measured in TEU, followed by Indonesia (5.3%) and Malaysia (3.1%). However, a 1% spurt in Korea's economic growth rate would lead to merely 1.3% increase of Korea's import volume from Thailand and 1.7% increase from the Philippines in the long run.

The influence of trade elasticities of real exchange rate, commonly known as price elasticity, between Korean and respective member countries of ASEAN on Korea's export and import proved symmetrical, when trade was measured in TEU. If Korean *Won* experiences a real depreciation, Korea's export volume to Indonesia, Malaysia, the Philippines and Thailand almost unanimously increases. Under the same scenario, however, an increase of real exchange rate of Korea will lead to a decline of import from Thailand only while increasing Korea's import from Malaysia and the Philippines. This implies that the role of real exchange rate in balancing trade between Korea and ASEAN five countries, at least in volume term, remains asymmetrical, if the trade is measured in container volume, rather than in value.

One interesting observation was that the impact of Korea-ASEAN FTA which came into effect from August 2007 seemed to have either negligent influence on or negatively impart Korea's bilateral trade measured in TEU, between Korea and five ASEAN countries. The only exception to this conclusion was Thailand from which Korea's import volume seemed stimulated by the free trade agreement. Certainly, these findings of FTA influence on trade between Korea and five ASEAN member countries deserve more systemic investigation of the relationship while a caution needs to be taken simply because the ratification of Korea-ASEAN FTA coincides closely with the global financial crisis and subsequent downturn of the global economy. In the meantime, in order to have this preferential trading arrangement between Korea and ASEAN have a more desirable bilateral trade promoting effect, as Hayakawa et al. (2014) suggest, more proactive preferential tariff negotiation should be made for volume export or make the rules of origin less stringent. Additionally, Korea may need to closely cooperate in the future with ASEAN trading partners in promoting the the preferential trade promoting effect of the Korea-ASEAN FTA

[7] However, for the Korea's import demand equation from Singapore and Thailand the existence of the cointegration relationship may seem in doubt.

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